

THE MANZANITAS OF BAJA CALIFORNIA,
INCLUDING A NEW SPECIES OF ARCTOSTAPHYLOS

PHILIP V. WELLS

Department of Botany, University of Kansas, Lawrence 66044

As long ago as 1905, an undescribed species of *Arctostaphylos* was thought to occur in northern Baja California (Goldman, 1916, p. 359): "A specimen of an undetermined and perhaps undescribed manzanita bearing ripe fruit was taken at about 1500 meters altitude along the trail on the west slope of the San Pedro Mártir Mountains between Rancho Santo Tomás and San Antonio, July 28. The species is less abundant than *A. glauca*, with which it occurs. In habit of growth it is similar to *glauca*, reaching a height of 1.8 to 3 meters."

During the past decade, Reid Moran of the San Diego Museum of Natural History has made numerous collections of a peculiar glaucous manzanita (possibly Goldman's) from the same area and elsewhere in Baja California—from the Sierra Juárez south to the Sierra San Borja, nearly halfway down the peninsula. It is a new burl-forming species, not belonging to either the *Arctostaphylos glandulosa* or the *A. tomentosa* groups. In the glaucous foliage, there is a resemblance to *A. glauca* Lindley, but it differs from that well-marked species in 20 other characters out of a total of 70 characters that I have examined.

Arctostaphylos peninsularis P. V. Wells, sp. nov. Frutex erectus, 1–3 m altus, 1–5 m latus; caudex tumescens; cortex levis ruber; ramuli glabrati; folia glauca, stomatifera supra et infra, ovata oblongave, apice obtusa acutave, basi acuta obtusave, petiolo 4–6 mm longo; inflorescentia paniculata, congesta, ramulis 1–6, saepe 2–3, glabrati; bracteae subulatae, acuminatae, glabratae; pedicelli glabratis, 4–6 mm longi; corolla globosa, 5–6 mm longa, 5 mm lata; ovarium glabratum; drupa globosa, glabrata, glauca, cinnamomea, 5–9 mm in diametro; endocarpus solidus, nuculis coalescentibus.

Holotype: gravelly hillside 1 mile east of Corral de Sam, elevation 2200 meters (7200 ft.), Sierra San Pedro Mártir, Baja California, near 31°03' N, 115°33' W, *Reid Moran 15531*, SD.

Erect shrub, 1 to 3 m high by 1 to 5 m wide, with a basal burl as much as 6 dm in diameter, or in some individuals the burl apparently absent; lower branches sometimes prostrate on ground, sometimes rooting adventitiously. Bark red-brown, smooth, branchlets glabrous; foliage buds smooth, not viscid. Leaves isofacial with about equal numbers of stomata above and below, glabrous and glaucous, oblong-ovate to ovate, apex obtuse or rounded to acute, base acute to obtuse or rounded, 2–4 cm long, on petioles 4–6 mm long. Panicle compact, with 1–6 (mostly 2–3) rachis-branches, the flowers crowded; nascent inflorescence cernuous, with closely appressed, scale-like deltoid-subulate, glabrous bracts; during anthesis lower as well as upper bracts subulate, with acuminate tips, not

becoming foliaceous and not elongating much in fruit. Pedicels glabrous, 4–6 mm long, not recurved in fruit. Corolla globose, 5–6 mm long, 5 mm wide. Ovary glabrous; mature fruit globose, 5–9 mm in diameter, light tan or reddish brown, glabrous, glaucous; exocarp thin, glaucous; mesocarp (pulp) thin; endocarp a solid, apiculate stone, not separating into nutlets.

Arctostaphylos peninsularis is a well-marked species that has been overlooked because of its out-of-the-way distribution in the mountains of Baja California. The glaucous foliage is deceptively similar to that of *A. glauca*. However, *A. peninsularis* differs from *A. glauca* and all other known taxa of *Arctostaphylos* in a wide array of characters. It is a crown-sprouting, shrubby species, tending to develop massive burls and widely-spreading lower branches that sometimes take root. *Arctostaphylos glauca* is an erect, arborescent shrub, lacking the burl. In *A. glauca* the bracts of the nascent inflorescence are deltoid or broadly subulate with divaricate tips; at anthesis it has a larger and more diffuse inflorescence with the lower bracts foliaceous, and all of the bracts become enlarged and prominently divaricate in fruit. Moreover, in *A. glauca*, the glandular-hispidulous pedicels are longer (6–8 mm); the urceolate corolla is larger (9 mm long by 7 mm wide); the ovary and fruit are extremely glandular-viscid, never glabrous; and the mature fruit is much larger (10–15 mm) with a thick, leathery pericarp that is never glaucous.

In fact, *Arctostaphylos peninsularis* resembles *A. glauca* chiefly in the glaucous foliage and solid stone-like endocarp, two striking characters that have been weighted in *Arctostaphylos* taxonomy. Even though they differ in at least 20 other characters, I refrain from calling this a superficial resemblance because it seems possible that there may have been a close connection between *A. glauca* and *A. peninsularis*. On the other hand, one of the traits the two species hold in common—the solid, stone-like endocarp—appears as a striking parallelism in most of the manzanitas endemic to Baja California and adjacent southern California from the Transverse Ranges south, but not in the manzanitas of northern California. The prevalent condition in the genus is, of course, an endocarp irregularly divided into several, often 4–6, nutlets. The other species having drupes with a single massive stone are *A. australis* Eastw., *A. parryana* Lemm., *A. pringlei* var. *drupacea* Parry, and *A. refugioensis* Gankin. The other narrow endemic of the extreme south, *A. otayensis* Wiesl. & Schreib., also has solid stones, but shows variation to separable nutlets. Significantly, the allied monotypic genus *Xylococcus*, another endemic of southern California and Baja California, also has massive, undivided endocarps. It is well known that the germination of many chaparral species is triggered by fire (Sampson, 1944; Stone and Juhren, 1951; Sweeney, 1956; Quick, 1959; Wells, 1969), but it is probable that limits of heat tolerance exist. It seems likely that the thick-walled, woody, undivided endocarp has been selected because of its greater resistance to fire,

even though it greatly diminishes the dispersal capacity; the problem invites experiment.

With the aid of the following key, *A. peninsularis* can be distinguished from other members of the genus, and from the closely allied monotypic genera, that occur in Baja California and adjacent southern California.

Key to the Manzanitas of Baja California and Vicinity

- a. Leaves opposite or whorled, or, if alternate, then in two ranks, bifacial, strongly revolute, usually tomentose below; inflorescence either diffusely cymose with oppositely arranged rachis-branches and pedicels, or compactly umbelliform; sepals wooly on outer face; ovary tomentose, fruit glabrescent.
 - b. Leaves opposite or whorled, linear or linear-lanceolate; inflorescence diffusely cymose with filiform, oppositely-branched rachises; pedicels filiform, in pairs or whorled, much longer than the tiny urceolate flowers; each pedicel bearing a pair of scale-like bracts toward the middle; endocarp divided into nutlets. Narrow endemic, n.w. Baja California. *Ornithostaphylos oppositifolia* (Parry) Small [*Arctostaphylos oppositifolia* Parry]
 - bb. Leaves alternate and two-ranked, or opposite, oblong-ovate; inflorescence compactly umbelliform with a short, thick, simple rachis; pedicels stout, shorter than the coarse, saccate, obovoid flowers; each pedicel subtended only at the base by a pair of bracts; endocarp a solid, apiculate stone. Los Angeles Co. south to central Baja California. *Xylococcus bicolor* Nutt. [*Arctostaphylos bicolor* (Nutt.) Gray]
 - aa. Leaves alternate, in more than two ranks, isofacial or bifacial (ours all isofacial), not strongly revolute; inflorescence paniculate or racemose, with spirally arranged rachis-branches and pedicels; ovary and fruit tomentose, glandular-viscid, or glabrous *Arctostaphylos*
 - c. Bracts of inflorescence at anthesis foliaceous, thick, not membranous or scale-like; rachis of nascent inflorescence thick with densely imbricated bracts.
 - d. Burl present at base of stem, crown-sprouting; nascent inflorescence cernuous, with 2-3 branches, the bracts deltoid to short-lanceolate; endocarp divided into nutlets. Wide-ranging, Oregon to n. Baja California *A. glandulosa* Eastw.
 - dd. Burl absent, not crown-sprouting; nascent inflorescence stiffly erect, with 4-5 branches, the bracts elongate-lanceolate and widely overlapping; endocarp a solid stone or irregularly divided into nutlets. Narrow endemic, mountains of southern San Diego Co. *A. otayensis* Wiesel. & Schreib.
 - cc. Bracts of inflorescence at anthesis scale-like (or membranous and bright red), deltoid to subulate, or the lowermost 1-2 bracts foliaceous; rachis of nascent inflorescence with minute, scale-like bracts.
 - e. Leaves bright green with lustrous cuticle; endocarp divided into several nutlets; burl absent.
 - f. Inflorescence racemose or with 1-2 branches, with a prominently clavate rachis, the flowers long-pedicelled, crowded at the thick distal end; rachis and bracts not glandular. Wide-ranging, Monterey Co. to Sierra San Pedro Mártir, n. Baja California; Arizona to Oaxaca *A. pungens* H.B.K.

- ff. Inflorescence an ample, several-branched panicle; the slender rachises and bracts glandular-puberulent. Wide-ranging, California to Colorado, south at high elevations (above 7,000 ft.) to the Sierra San Pedro Mártir, Baja California.
- A. patula* subsp. *platyphylla* (Gray) Wells
- ee. Leaves glaucous, pallid, or gray-green, dull; endocarp a solid stone, not separating into nutlets (except in *A. pringlei* subsp. *pringlei*).
- g. Bracts membranous, bright red or pink at anthesis; sepals linear-oblong, prominently glandular-ciliate; ovary, pedicels, bracts, rachises, and branchlets densely glandular-pubescent; fruit glandular-viscid; leaves scabrous with glandular hairs.
- h. Endocarp separating into several discrete nutlets. Sierra Juárez and Sierra San Pedro Mártir, n. Baja California; Arizona *A. pringlei* Parry subsp. *pringlei*
- hh. Endocarp a solid, undivided stone; leaves usually grayer, more orbicular and subcordate. Mountains of s. California from San Bernardino and Santa Ana Mtns. south. *A. pringlei* subsp. *drupacea* (Parry) P. V. Wells, comb. nov. [*A. pringlei* var. *drupacea* Parry, Bull. Cal. Acad. 2:495. 1887].
- gg. Bracts mostly scale-like, not membranous or red; sepals ovate, eglandular; leaves glabrous and smooth.
- i. Nascent inflorescence with stiffly erect, thread-like rachises and minute, deltoid, scaly bracts; at anthesis panicle diffusely branched; leaves elliptic, pallid or gray-green. Narrow endemic, near coast, n.w. Baja California: Pine Canyon, San Antonio del Mar (31° 18'N); Cerro Blanco (32° 03'N).
A. australis Eastw.
- ii. Nascent inflorescence mostly cernuous, with stout rachises and coarser, subulate bracts; leaves ovate, very glaucous.
- j. Basal burl absent; erect, arborescent shrub, lower branches not prostrate and rooting; panicle large and openly branched, the lowest bracts foliaceous, the upper bracts enlarged and divaricate in fruit; pedicels 6-8 mm long, glandular-hispid; corolla urceolate, 8-10 mm long; ovary glandular; fruit very glandular-viscid, 10-15 mm in diameter, with thick leathery pericarp; leaves round-ovate with truncate to subcordate base, on petioles 10 mm or more long. Wide-ranging in Coast, Transverse and Peninsular Ranges from Contra Costa Co. south to Sierra San Pedro Mártir; to Sierra San Borja, c. Baja California.
A. glauca Lindl.
- jj. Basal burl usually present; erect or spreading shrub, lower branches sometimes prostrate and rooting; panicle more compact, the bracts not foliaceous, not enlarging much in fruit; pedicels 4-6 mm long, glabrous; corolla globose, 5-6 mm long; ovary glabrous; fruit glabrous and glaucous, 5-9 mm in diameter, with thin pericarp; leaves oblong-ovate with acute to rounded base, on petioles 4-6 mm long. Endemic to mountains of northern half of Baja California, from Sierra Juárez to Sierra San Borja *A. peninsularis* Wells

Reid Moran has collected in coastal northwestern Baja California a number of specimens of *Arctostaphylos* that are not accommodated by the existing taxonomy. They recombine, in limited ways, the characters of *A. glauca*, *A. glandulosa*, and *A. australis*. Field studies will be required to establish the characteristics of the populations from which these samples were taken.

Arctostaphylos peninsularis has its principal populations in the Sierra San Pedro Mártir from 31°16' N south to 30°35' N, with outliers in the Sierra Juárez (to Laguna Hanson, near 32° N), Cerro San Luis (29°19' N), and the Sierra San Borja (28°47' N). The latter range is isolated from the San Pedro Mártir populations by about 150 miles of *Idria* desert, and is the southernmost known outpost of *Arctostaphylos* on the peninsula (R. Moran, personal communication). Moran has made several collections of manzanitas in the Sierra San Borja, one of which (*Moran 9926*, SD, UC; Tigre Canyon, 28°51' N) appears to be the only record of *A. glauca* south of Cerro Matomí and Cerro San Juan de Dios, two isolated peaks just south of the San Pedro Mártir range. Specimens of *A. peninsularis* from Cerro el Sauco at 28°46' N in the San Borja range differ from the typical San Pedro Mártir populations in having minutely glandular-puberulent rachises, bracts, pedicels, and in some, branchlets and petioles. Disposition of this glandular form is deferred until further examination of the San Borja manzanitas can be made in the field.

In the Sierra San Pedro Mártir, *Arctostaphylos peninsularis* has been collected at elevations of about 4000 to 8000 ft., a zone intermediate between, and partly overlapping, the zones occupied by *A. glauca* and *A. patula* subsp. *platyphylla*. Below 4000 ft., *A. glauca* fills the manzanita niche, and above 8000 ft., *A. patula platyphylla* predominates. The partial coexistence of the burl-forming *A. peninsularis* with two nonsprouting taxa, lacking burls, follows the general rule for sympatry in *Arctostaphylos*: species with dissimilar modes of reproduction in response to fire tend to grow together more often than species with similar strategies (Wells, unpublished data). An analogy can be drawn with a very similar trio of manzanitas segregating along an elevation gradient in the Sierra Nevada: *A. viscida* Parry, *A. mewukka* Merriam, and *A. patula* Greene subsp. *patula*. The species occupying an intermediate zone of elevation, *A. mewukka*, is a burl-forming manzanita superficially resembling *A. peninsularis*, and intermediate in morphology and ecology between *A. viscida* (a lower elevation, nonsprouting species related to *A. glauca*) and *A. patula* subsp. *patula* (a higher elevation, burl-forming version of *A. patula platyphylla*). For the Sierra Nevada trio, we also have cytological information; *A. mewukka* is tetraploid ($n = 26$), and the other two taxa are diploid (Wells, 1968). This, in conjunction with the morphological, ecological, and spatial intermediacy of *A. mewukka*, suggests that it is

an amphidiploid species stemming from the cross *A. viscida* × *A. patula*. If there is predictive value in a comprehensive cytotaxonomic, morphological and ecological survey of the genus, it seems likely that the species *A. peninsularis* may have had an analogous ancestry, involving *A. glauca* and *A. patula*.

LITERATURE CITED

- GOLDMAN, E. A. 1916. Plant records of an expedition to Lower California. Contr. U. S. Nat. Herbarium 16:309-371.
- QUICK, C. R. 1959. Ceanothus seeds and seedlings on burns. Madroño 15:79-81.
- SAMPSON, A. W. 1944. Plant succession on burned chaparral lands in northern California. Univ. Calif. Coll. of Agri. Bull. 685.
- STONE, E. C. and G. JUHREN. 1951. The effect of fire on the germination of *Rhus ovata* Wats. Amer. J. Bot. 38:368-372.
- SWEENEY, J. R. 1956. Responses of vegetation to fire. Univ. Calif. Publ. Bot. 28:143-250.
- WELLS, P. V. 1968. New taxa, combinations, and chromosome numbers in Arctostaphylos (Ericaceae). Madroño 19:193-210.
- . 1969. The relation between mode of reproduction and extent of speciation in woody genera of the California chaparral. Evolution 23:264-267.

LEGUMES OF THE U.S. VI.
CALLIANDRA, PITHECELLOBIUM, PROSOPIS

DUANE ISELY

Department of Botany and Plant Pathology,
Iowa State University, Ames 50010

Herein, I complete a generic summary of the mimosoid legumes of the United States, except for cultivated *Acacia*. The objectives and format of these publications are briefly delineated in Isely (1969). The treatments include generic descriptions, keys to species, range and habitat characterization, and taxonomic and nomenclatural commentary.

Accessions of material of the subject genera from the following herbaria were studied in preparation of this paper: NY, ISC, TEX, NMC, LAF, ARIZ, FSU, USF, POM, and RSA. Selected materials and (or) types have been studied by courtesy of: GH, MO, LL, US, LA, and PH. My debt to the institutions and curators is obvious. And my thanks to several botanical friends (Rupert Barneby, Marshall Johnston, R. W. Pohl, Jean Wooten) who reviewed this manuscript or portions of it.

Journal Paper No. J-6606 of the Iowa Agriculture and Home Economics Experiment Station, Ames, Iowa. Project 1814. The facilities of the Iowa State Herbarium, supported by the Science and Humanities Research Institute, were used in the preparation of this paper. This research is funded by the National Science Foundation, Grant GB-7342.